

2005-2006 RUFFED GROUSE POPULATION STATUS IN VIRGINIA

by

GARY W. NORMAN

*Virginia Department of Game & Inland Fisheries
P.O. Box 996
Verona, Virginia 24482*

Abstract: Two spring drumming surveys and two fall hunter surveys were conducted to monitor ruffed grouse population status in Virginia. Spring 2005 breeding populations were below average based on roadside drumming indices. Fall 2005–06 population levels were also below average based on flushing rates from grouse hunters and observations of grouse by bow hunters. Cooperating grouse hunters reported 0.85 grouse flushed per hour during the 2005–06 hunting season. Recruitment was above-average based on the percentage of juveniles harvested by grouse hunters, but observations of grouse broods by field staff declined in 2005. Grouse hunter satisfaction ratings for the 2005–06 season were comparable (3.0 on scale of 1–7) to last year (3.1). All indices suggested a declining population at low levels in Virginia during 2005–06. Spring 2006 breeding population levels remained at low levels. Trend analyses suggest a significant 3.1% annual decline in grouse breeding population levels based on roadside drumming counts in Virginia over the past 10 years.

The ruffed grouse (*Bonasa umbellus*) is a popular game bird in Virginia. Approximately 14,237 hunters hunted 62,666 days to harvest 22,728 grouse during the 2004–05 season (Jagnow and Steffen 2005). Harvest management of grouse populations, by regulating hunting season length and bag limits, is the responsibility of the Virginia Department of Game and Inland Fisheries (VDGIF). The VDGIF seeks to maintain grouse populations at levels that provide quality hunting and nonconsumptive opportunities in Virginia's occupied grouse range. Annual surveys of grouse populations and harvests were used to help evaluate the status of ruffed grouse in Virginia.

The Department would like to thank the individuals who cooperated with ruffed grouse and spring grouse surveys. Appreciation is extended for their time and effort to provide valuable information for ruffed grouse management in Virginia. We would also like to thank staff of VDGIF and U.S. Forest Service for their assistance with the Roadside Drumming Survey. Special thanks are given to Mr. J. W. Coleman and H. R. Mobley for volunteering their time to assist with the Drumming Survey.

METHODS

Grouse Hunter Survey

A non-random volunteer group of past and new cooperating hunters (cooperators) were included in the 2005–06 survey. Past cooperators have been solicited from other VDGIF quail and woodcock survey cooperators, Virginia members of the Ruffed Grouse Society and Quail Unlimited, popular articles, and press releases.

Data sheets and wing envelopes were provided to cooperators (Appendix A). Cooperators were asked to report the number of hours they hunted, grouse flushed, and grouse killed by county and land ownership types. Cooperators were also asked to rate individual hunt quality on a scale ranging from a low of 1 (poor) to a high of 7 (excellent).

To determine sex and age related information of the grouse population, cooperators were asked to provide tail and wing feather samples from any birds they harvested. Age (juvenile or adult) was determined by examining the curvature of the tenth primary, the presence or absence of sheathing, and the length of the 9th primary (Davis 1969). Where

equivocal age determinations were found using the different techniques, curvature of the wing tip and feather sheathing were considered the most reliable techniques. Sex was determined by examining the length of plucked mid-rectrix feathers (Davis 1969). Chi-square analyses were used to compare age and sex frequency distributions by month of the season and by region (Fig. 1, 2) of the state.

Survey flushing and harvest rate information was used as indices to fall population density and trends. Information on age distribution from hunter-collected feather samples was used as an index to annual recruitment.

The grouse hunting season dates were from 31 October 2005 to 11 February 2006. The bag limit was 3 per day. The season was closed in counties east of Interstate 95.

Fall Bow Hunter Survey

A non-random volunteer group of archery deer hunters reports the number of grouse while hunting deer in the early deer archery season. Participating archers provide information on the number of grouse seen, hours hunted, and the county hunted (Fies and Norman 2005).

Spring Gobbler Hunter Survey

A non-random volunteer group of spring gobbler hunters, primarily National Wild Turkey Federation members, provided information during the spring gobbler season on the county hunted, number of hours hunted, number of grouse heard drumming, and the number of grouse flushed (Norman 2005). Drumming (grouse/hunt) rates were used as indices to spring grouse population densities and trends. Drumming analyses were based on the first 2-weeks of the spring gobbler season when drumming rates were highest. Overall means and estimates were calculated as linear functions of annual estimates.

Roadside Drumming Survey

Routes ($n = 52$) were randomly chosen using 7.5 minute topographic maps within Virginia's occupied grouse range as the sampling units. Routes began at the intersection of secondary roads nearest the center of selected topographic maps. Random starting directions and random directions at subsequent intersections were made. Routes were at least 10

miles in length with 10 listening stops at 1-mile intervals. Routes were longer if hazardous road conditions were found within 100' of the 1-mile odometer reading. Each route was surveyed twice, once during the 2nd and 3rd weeks of April. The survey began 30 minutes before sunrise. Observers recorded the number of drums during a 4-minute listening period. Disturbance was recorded (Appendix B). Stops with high disturbance were censored. Staff of the VDGIF, U.S. Forest Service, and volunteers conducted the surveys. Overall means and estimates were calculated as linear functions of annual estimates.

Breeding Population Trend Analysis

Population trends were based on the percent change in numbers of drums heard and numbers of drumming grouse heard in the Roadside Drumming Survey. Drumming data over the 10-year period were analyzed with a multiplicative model using a log transformation and linear regression (Sauer and Geissler 1990):

$$y = ab^xe$$

where, y = number of drums per stop or number of drumming grouse per hunt, x = year, a = intercept, b = trend, and e = error term. Logarithms were used to make the model a linear regression: $\ln(y + 0.05) = \ln(a) + \ln(b)x + \ln(e)$. The slope of the linear regression, $\ln(b)$, was back-transformed to estimate b (Bradu and Mundlak 1970) where,

$$b = e^{[\ln(b) - 0.5\text{var}\{\ln(b)\}]}$$

The percent change per year was $100(b-1)$. Trends were considered significant if the regression was significant ($P < 0.05$).

Brood Observation Survey

Staff of the VDGIF and Forest Service reported ancillary observations of grouse during their normal work schedule. Observations were made during the months of May through September. Personnel reported numbers of single adults, hens with broods, young grouse, and whether or not the entire brood could be counted. Brood observations were used as indices of hen success and chick survival.

RESULTS

Population Trends and Densities

Spring 2005. Roadside Drumming Survey observers heard a total of 69 drums at 981 acceptable stops. The mean number of drums heard per route was 0.78 (Table 1). The 2005 roadside drumming rate was below the long-term survey average (1.37 grouse/route).

Cooperating spring gobbler hunters reported hearing 431 drummers and flushing 126 ruffed grouse during 1,114 hunts in Virginia's primary grouse range between 9–23 April 2005. Cooperators heard a rate of 0.39 drumming grouse/hunt and they flushed 0.11 birds/hunt during the survey period (Table 1). The 2005 drumming rate was below the survey average of 0.62 drumming grouse/hunt. In 2005 drumming increased in the Southwest Region but no change was seen in the other regions between years. Drumming rates were comparable across regions (Fig. 2).

Fall-Winter 2005–06. Cooperating grouse hunters ($n=63$) reported data from 888 hunts. Cooperators averaged hunting 13.8 days during the season (Table 2). An average hunt lasted 3.3 hours (Table 2). Hunters reported flushing 2,447 birds while hunting 2,867 hours (Table 3). Flushing rates were comparable throughout the months of the season (Table 3). Throughout the season hunters averaged flushing 0.85 grouse per hour, which is lower than the long-term average of 1.15. The 2005–06 flushing rate was considerably less than the 2001–02 season where a record flushing rate (1.61) was reported. The lowest flushing rate occurred in 1976–77 (0.72 grouse/hr). Most states in the Mid-Atlantic region have also seen flushing rates decline in recent years (Fig. 5).

Cooperators harvested 285 grouse or 4.5 grouse per hunter per season. On average, 10.1 hours of hunting was required to harvest a grouse. Harvest rates were lower in November. Little difference in harvest rates (kill/hr) was found in the other months of the season (Table 3).

Cooperators in the Southern Region of Virginia's grouse range have typically reported higher flushing rates than cooperators in the Northern Region (Table 6, Fig. 1). The pattern in 2004–05 season was predictable, with flushing rates in Southern Region (1.15) exceeding the Northern (0.69). Harvest rates were also higher (0.13 kills/hr) in the Southern Region than the Northern (0.08 kills/hr). Quality

indices were 3.1 for Southern Region hunters compared to 2.9 for Northern counterparts.

Bow hunters ($n=288$) reported seeing 135 grouse in 4,065 bow hunts in the 2005 early archery season. In counties west of the Blue Ridge Mountains archers reported seeing 2.2 grouse per 100 hours of hunting. Archers reported seeing a high of 5.2 grouse per 100 hours in the 1997 season. The lowest number of grouse reported was in the 2005–06 season (Fig. 3).

Spring 2006. Roadside Drumming Survey observers heard a total of 66 drums at 861 acceptable stops. The mean number of drums heard per route was 0.77 (Table 1). The 2006 data may suggest further decline in grouse breeding populations. The 2006 roadside drumming rate was the lowest rate observed during the 12-year history of the survey. The highest number of drums reported in the history of the 12-year survey was 189 in the 2001 survey.

Cooperating spring gobbler hunters reported hearing and flushing similar numbers of grouse while turkey hunting in 2006 (Table 1). Both 2006 spring surveys suggest that breeding populations were below average.

Long-Term Trends. Trend analyses suggest that breeding population levels have declined 3.1% annually over the past 10 years using data from the roadside drumming survey ($P < 0.001$). Trend data (Fig. 3) from the spring gobbler hunter survey also suggested a 2% annual decline over the past 15 years ($P < 0.001$).

Recruitment

Cooperators submitted 403 usable wings for age and sex determination. Juvenile birds comprised 48% of the sample with a ratio of 2.4 juvenile birds per adult female (Table 5). The 2005–06 recruitment index of juvenile birds in the harvest was higher than the long-term average (41%).

Juveniles normally comprise a large percentage of the harvest in the early months of the season and adults typically comprise the majority of the harvest at the end of the season. This pattern was suggested in the 2005–06 season as juveniles comprised more of the early season harvest (Table 5). However, age ratios were not significantly different by month ($X^2 = 4.5$, $df = 4$, $P = 0.35$). No difference in age ratios were found between the Southern and Northern regions as juveniles comprised 58% of the Northern

Region and 42% of the Southern Region harvest ($X^2 = 1.28$, $df = 1$, $P = 0.26$).

Males comprised 58% of the harvest (Table 5). Harvest sex ratios were not significantly different ($X^2 = 5.2$, $df = 4$, $P = 0.27$) by month (Table 5) of the season or between regions ($X^2 = 0.23$, $df = 1$, $P = 0.63$; Table 6).

The total number of grouse seen by staff ($n = 76$) during the spring and summer months in 2005 was the lowest reported in the survey history. The number of young per complete brood was the lowest reported during the survey history (2.8). The long-term average for complete brood counts is 4.2 young per adult.

Although males would be included as single adults, the observed ratio of successful hens to total adults observed may be a useful index to the percentage of hens that successfully hatch clutches. To be useful as a trend index, the observation probability for males and females (both successful and unsuccessful) must be consistent over time. This index indicated female success (53%) was near the long-term average in 2005 (Table 7). Taken collectively, these recruitment results may suggest that breeding population levels were low and recruitment was slightly below long-term averages.

Hunters and Hunter Satisfactions

Cooperating grouse hunters rated hunts an average quality rating of 3.0 throughout the season based on a potential range of 1–7, where 1 was poor and 7 was excellent. The 2005–06 quality rating was comparable to 2004–05 and was better than the 2003–04 season where satisfaction ratings were 2.7 (Table 2). Cooperators' ratings of hunting quality were comparable in the later months of the season (Table 3).

Cooperators hunting on private lands reported higher flushing rates (1.08) than state (0.81) or federal-owned (0.73) lands. Hunt quality ratings were slightly higher on private lands (3.4) and state-owned (3.4) than federal lands (2.9).

Cooperators hunting with dogs reported higher flushing rates (0.88 flushes/hr) and harvest rates (0.10 kills/hr) than those hunting without dogs (0.39 flushes/hr, 0.03 kills/hr; Table 8). Although they flushed fewer and killed fewer birds, hunter satisfactions were higher among those hunters who did not use a dog (Table 8).

DISCUSSION AND SUMMARY

Breeding populations of ruffed grouse continued a downward trend in the spring of 2005. Reproduction in the spring-summer of 2005 appeared to be near normal based on the percentage of juveniles in the fall harvest. However, observations of grouse broods by field staff suggested poor reproduction as fewer grouse broods were observed during the summer. Low flushing rates by cooperators in the fall hunting season as well as low numbers of grouse reported by bow hunters seemed to support the idea that reproduction was low and populations were below-average. The bad news continued in the spring of 2006 with even lower numbers of drummers. Collectively, it appears the grouse population is at a low level based on most survey indices. The long-term analyses suggest an annual rate of decline of approximately 2–3 percent per year.

The cause of the recent decline in grouse numbers is unknown. Early successional habitat has declined on most public lands, particularly on Virginia's National Forests. Grouse population trends may reach some low equilibrium in the future unless habitat conditions improve. Time will tell if we're near that point or if the grouse population will decline even more. Further compounding the loss of habitat has been the poor mast conditions in 3 of the last 5 years. Department research has discovered that grouse reproduction is closely tied to the condition of the females. Acorns are a preferred food that are rich in fat and energy and during years of good acorn crops grouse body fat levels generally increase. Higher body fat levels are believed to improve grouse fitness as they move less for food, have smaller home ranges, and have reduced vulnerability to predation. Taken in total, the availability of early successional habitats and acorn production are likely to be a significant factors regulating grouse populations in the Appalachians.

Grouse population indices in the Southern Region of the state typically have been higher than the Northern Region based on previous surveys, a finding supported by the 2005–06 grouse hunter survey. However, spring drumming rates were not significantly higher in the Southern Region and

recruitment levels were comparable across regions.

Regional variation in weather and mast crops may have contributed to the apparent difference in production between areas. Cooperating grouse hunters reported higher flushing rates on private lands than public-owned lands. One explanation could be that private lands have better habitat or lower hunting pressure than public lands. Forest management on national forest lands is declining in Virginia so the future for grouse habitat and grouse hunting on national forest lands is uncertain.

While the trend in grouse populations is not encouraging, findings of the Appalachian Cooperative Grouse Research Project (ACGRP) indicate the creation of additional habitats using clear cuts or shelterwoods cuts may help stabilize or increase local grouse populations. Results of the ACGRP can be found on the Department's web site (www.dgif.virginia.gov). The study found no effects of hunting on grouse populations in the region. It is apparent however that the declines seen in Virginia's grouse populations are also being seen in other states in the region (Fig. 5).

The George Washington National Forest is currently undergoing a review of its management plan. The Department is encouraging the creation of additional early successional habitats to benefit grouse and other wildlife species with similar needs. We urge hunters to become involved in the planning process and express their opinions about management of the George Washington National Forest.

Hunting ruffed grouse in the southern Appalachians is a challenging sport as evidenced by the return of 1 grouse for every 10 hours of hunting. It nevertheless can be very enjoyable, particularly on those days when the dogs work well, the birds hold tight, and your aim is true. Thanks again to those dedicated hunters that contribute to these Department surveys and still enjoy the often difficult world of grouse hunting the Appalachians.

M. S. Thesis, Virginia Tech, Blacksburg, VA.

Davis, J. A. 1969. Aging and sexing criteria for Ohio ruffed grouse. *Journal of Wildlife Management* 33:628–636.

Fies, M. and G. W. Norman, 2004. 2003 Virginia Spring Gobbler Survey. Virginia Department of Game and Inland Fisheries, Richmond, Virginia, USA.

Jagnow, C. P. and D. E. Steffen. 2005. Virginia Survey of Hunter Harvest, Effort and Attitudes 2004-2005. Virginia Department of Game and Inland Fisheries, Richmond, Virginia, USA.

Norman, G. W. 2005. 2004 Virginia Spring Gobbler Survey. Virginia Department of Game and Inland Fisheries, Richmond, Virginia, USA.

LITERATURE CITED

Bumann, George B. 2002. Factors influencing predation on ruffed grouse in the Appalachians.

Table 1. Mean drumming rates (\pm SE) of ruffed grouse reported by Spring Gobbler Survey hunters (drumming grouse/hunt) and the Roadside Drumming Survey (drumming grouse/route stop) in Virginia.

Year	<u>Spring Gobbler Survey</u>				<u>Roadside Survey</u>
	Southwest	Central	North	State	State
1992	0.90 \pm 0.05 (579)	0.83 \pm 0.05 (538)	1.00 \pm 0.11 (169)	0.89 \pm 0.04 (1,286)	
1993	0.51 \pm 0.05 (433)	0.62 \pm 0.05 (451)	0.37 \pm 0.08 (90)	0.55 \pm 0.03 (974)	
1994	0.54 \pm 0.06 (343)	0.60 \pm 0.04 (472)	0.71 \pm 0.10 (130)	0.59 \pm 0.03 (945)	1.37 \pm 0.22 (93)
1995	0.62 \pm 0.05 (483)	0.62 \pm 0.04 (558)	1.11 \pm 0.12 (159)	0.69 \pm 0.03 (1,200)	1.07 \pm 0.21 (96)
1996	0.60 \pm 0.04 (556)	0.69 \pm 0.06 (590)	0.87 \pm 0.09 (182)	0.67 \pm 0.03 (1,328)	1.71 \pm 0.31 (98)
1997	0.65 \pm 0.05 (497)	0.69 \pm 0.05 (519)	0.92 \pm 0.08 (263)	0.72 \pm 0.03 (1,279)	1.50 \pm 0.3 (98)
1998	0.61 \pm 0.04 (494)	0.50 \pm 0.04 (531)	0.62 \pm 0.06 (245)	0.57 \pm 0.03 (1,270)	1.17 \pm 0.22 (95)
1999	0.58 \pm 0.05 (520)	0.48 \pm 0.03 (634)	0.71 \pm 0.06 (289)	0.56 \pm 0.03 (1,443)	1.42 \pm 0.21 (87)
2000	0.63 \pm 0.06 (446)	0.67 \pm 0.05 (523)	0.57 \pm 0.06 (272)	0.64 \pm 0.03 (1,241)	1.42 \pm 0.22 (89)
2001	0.71 \pm 0.05 (533)	0.72 \pm 0.05 (559)	0.64 \pm 0.07 (279)	0.70 \pm 0.03 (1,371)	1.91 \pm 0.31 (90)
2002	0.62 \pm 0.05 (520)	0.72 \pm 0.05 (494)	0.37 \pm 0.05 (279)	0.60 \pm 0.03 (1,293)	1.50 \pm 0.24 (97)
2003	0.52 \pm 0.05 (450)	0.51 \pm 0.05 (420)	0.41 \pm 0.06 (264)	0.49 \pm 0.03 (1,134)	1.04 \pm 0.18 (91)
2004	0.45 \pm 0.04 (473)	0.36 \pm 0.04 (441)	0.38 \pm 0.06 (234)	0.40 \pm 0.03 (1,148)	0.94 \pm 0.15 (98)
2005	0.53 \pm 0.04 (450)	0.35 \pm 0.04 (438)	0.44 \pm 0.03 (226)	0.39 \pm 0.02 (1,114)	0.86 \pm 0.21 (88)
2006	0.40 \pm 0.03 (529)	0.46 \pm 0.04 (539)	0.40 \pm 0.13 (285)	0.42 \pm 0.03 (1,353)	0.77 \pm 0.16 (93)
Average ^a	0.62 \pm 0.01	0.62 \pm 0.01	0.69 \pm 0.02	0.62 \pm 0.03	1.28 \pm 0.15

^aOverall means and estimates were calculated as linear functions of annual estimates.

Table 2. Harvest, effort, and satisfaction summary of cooperating ruffed grouse hunters in Virginia.

Year	Coop. (n)	Hunts (n)	Hunts/ Season	Hours/ Hunt	Grouse/ Season	Kill/ Hour	Flush/ Hour	Hunt Qlty. ¹
1990–91	110	1,241	11.3	4.1	5.5	0.12	1.03	
1991–92	93	1,204	12.9	4.0	5.2	0.10	0.98	
1992–93	81	1,106	13.7	4.0	6.1	0.11	1.01	
1993–94	61	668	11.0	3.6	3.6	0.09	1.10	
1994–95	84	1,040	12.4	3.9	5.3	0.11	0.97	
1995–96	70	780	11.1	3.7	4.8	0.12	1.50	3.2
1996–97	114	1,269	11.1	3.9	5.4	0.13	1.26	3.6
1997–98	87	1,098	12.6	3.7	5.8	0.12	1.33	3.6
1998–99	69	963	13.9	3.3	5.5	0.12	1.11	3.4
1999–00	93	1,013	10.9	3.7	4.5	0.11	1.01	2.8
2000–01	62	904	14.5	3.7	7.9	0.15	1.45	3.6
2001–02	80	1,082	13.5	3.7	8.9	0.18	1.61	4.0
2002–03	64	851	13.3	3.6	6.1	0.13	1.11	3.2
2003–04	60	779	13.0	3.5	4.5	0.10	0.92	2.7
2004–05	94	1,275	13.6	3.3	4.8	0.11	1.03	3.1
2005–06	63	888	13.8	3.3	4.5	0.10	0.85	3.0

Hunt Qlty.¹ = Hunting quality based on a scale of 1 (poor) to 7 (excellent).

Table 3. Monthly harvest, effort, and satisfaction summary of cooperating ruffed grouse hunters in Virginia during the 2005–06 season.

Month	Days Hunted	Hours Hunted	Grouse Flushed	Flush/ Hour	Grouse Killed	Kill/ Hour	Hunt Quality ¹
October	26	92	78	0.85	8	0.09	3.0
November	160	533	391	0.73	32	0.06	2.7
December	237	751	637	0.85	74	0.10	3.1
January	288	989	958	0.97	122	0.12	3.1
February	157	502	383	0.76	49	0.10	3.1
Season ²	868	2,867	2,447	0.85	285	0.10	3.0

Hunt Quality¹ = Hunting quality based on a scale of 1 (poor) to 7 (excellent).

Season² = Season totals exceeds monthly totals because some hunts without dates were included.

Table 4. Sex ratios, flushing rates, and age distribution of ruffed grouse harvested by cooperating hunters in Virginia.

Season	% Males	% Females	% Juvenile	Flushes/Hour
1973-74	68	32	46	1.31
1974-75	67	33	26	1.00
1975-76	68	32	38	0.98
1976-77	64	36	20	0.72
1977-78	66	34	23	0.90
1978-79	67	33	34	1.21
1979-80	62	38	33	1.21
1980-81	65	35	36	1.44
1981-82	62	38	32	1.36
1982-83	62	38	40	1.57
1983-84	60	40	34	1.17
1984-85	59	41	43	1.17
1985-86	64	36	43	1.18
1986-87	62	38	41	1.40
1987-88	62	38	42	1.19
1988-89	67	33	22	0.83
1989-90	65	35	55	1.05
1990-91	62	38	59	1.03
1991-92 ^a	53 ^a	47 ^a	50	0.98
1992-93	57	43	47	1.01
1993-94	54	46	52	1.10
1994-95	63	37	32	0.97
1995-96	50	50	57	1.50
1996-97	52	48	43	1.26
1997-98	48	52	46	1.33
1998-99	56	44	46	1.11
1999-00	58	42	28	1.02
2000-01	52	48	47	1.45
2001-02	51	49	50	1.61
2002-03	57	43	38	1.11
2003-04	54	46	52	0.92
2004-05	62	38	52	1.03
2005-06	58	42	48	0.85
Average	60	40	41	1.15

^a Davis (1969) sex criteria adopted.

Table 5. Monthly age and sex composition (%) of ruffed grouse harvested by cooperating hunters during the 2005–06 season. The sample size for these monthly summary statistics were lower than the annual estimates because some samples did not include dates. Therefore, estimates based on the different sample sizes may be slightly different.

Month	Age		Sex		<i>n</i>
	Adult	Juvenile	Male	Female	
October	33	67	42	58	12
November	44	55	60	40	47
December	53	47	52	48	112
January	57	43	57	43	148
February	51	49	66	34	77
Season	47	53	57	43	396

Table 6. Age and sex composition of ruffed grouse harvested and flush rates by region.

Year	Percent Female		Percent Juvenile		Flushing Rate	
	North	South	North	South	North	South
1995-96	49	53	62	54	1.47	1.56
1996-97	51	45	38	46	1.17	1.37
1997-98	55	47	45	48	1.29	1.41
1998-99	42	47	44	49	1.06	1.20
1999-00	47	36	28	30	0.95	1.17
2000-01	48	48	43	52	1.36	1.64
2001-02	48	50	50	50	1.61	1.61
2002-03	49	38	33	40	0.85	1.48
2003-04	43	50	46	58	0.76	1.19
2004-05	61	39	64	36	0.84	1.26
2005-06	44	41	56	59	0.69	1.15

Table 7. Grouse brood observations reported by field staff.

Year	Adults ^a <i>N</i>	Suc. Fem. ^b <i>n</i>	% Suc. Index ^c	Total ^d <i>n</i>	\bar{x} Young Comp. ^e	\bar{x} Young Incomp. ^f	Observers <i>N</i>
1990	94	63	67	379	4.7	4.0	23
1991	92	73	79	364	4.3	3.5	26
1992	145	91	63	406	2.8	2.6	35
1993	76	42	55	260	4.2	4.0	27
1994	149	99	66	572	4.3	4.1	30
1995	182	130	71	776	4.3	3.8	29
1996	143	59	41	367	4.0	3.5	33
1997	126	83	69	451	3.8	3.7	37
1998	114	53	46	325	4.4	3.7	28
1999	183	125	68	746	4.9	4.1	33
2000	116	47	41	225	4.7	4.9	53
2001	123	78	61	348	4.2	5.0	48
2002	78	61	78	304	4.0	3.1	33
2003	50	8	16	139	4.5	4.1	30
2004	35	22	63	146	5.0	4.1	33
2005	30	16	53	76	2.8	4.1	33

^a Adults = count of all adults observed^b Suc. Fem. = count of females with young^c % Suc. Index = (Suc. Fem./total adults)*100^d Total = total adults and young observed^e \bar{x} Young Comp. = mean number of young per brood where observers reported complete counts^f \bar{x} Young Incomp. = mean number of young per brood where observers reported incomplete counts.

Table 8. Dog use and the success (flush and harvest rates) and satisfaction of cooperating ruffed grouse hunters in Virginia.

Year	Flushes/Hour		Kills/Hour		Hunt Quality ¹	
	Dogs	No Dogs	Dogs	No Dogs	Dogs	No Dogs
1995–96	1.58	1.38	0.12	0.07	3.6	2.5
1996–97	1.35	0.72	0.14	0.04	3.6	3.8
1997–98	1.41	0.91	0.13	0.08	3.7	4.2
1998–99	1.22	0.71	0.14	0.05	3.5	2.6
1999–00	1.09	0.59	0.11	0.06	2.8	3.4
2000–01	1.56	0.76	0.16	0.05	3.6	3.1
2001–02	1.66	1.26	0.19	0.12	4.0	4.3
2002–03	1.15	0.66	0.13	0.08	3.2	3.6
2003–04	0.98	0.48	0.10	0.04	3.0	2.8
2004–05	1.07	0.61	0.11	0.08	3.0	3.9
2005–06	0.88	0.39	0.10	0.03	3.0	3.1

Hunt Quality¹ = Hunt quality based on scale of 1 (poor) to 7 (excellent).

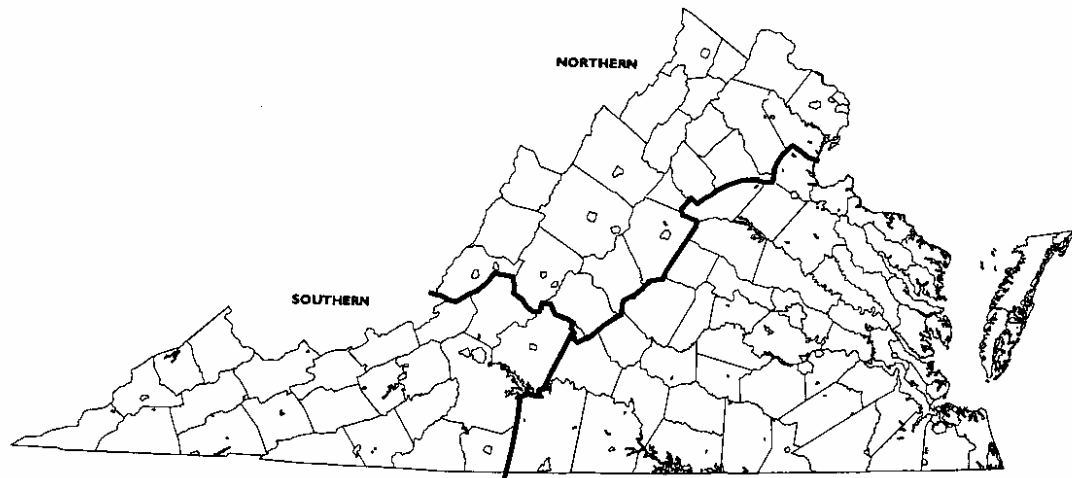


Figure 1. Ruffed grouse regions for fall hunter survey.

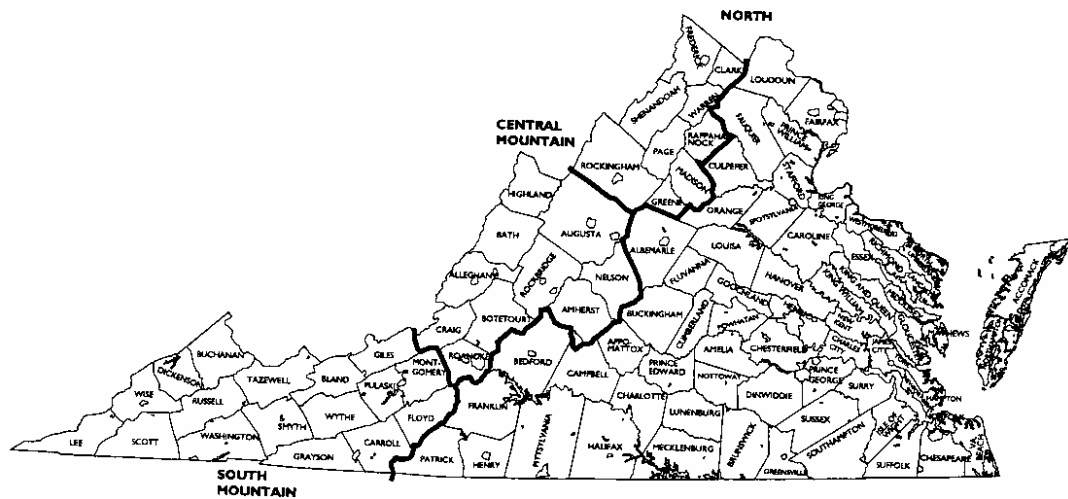


Figure 2. Ruffed grouse regions for spring drumming.

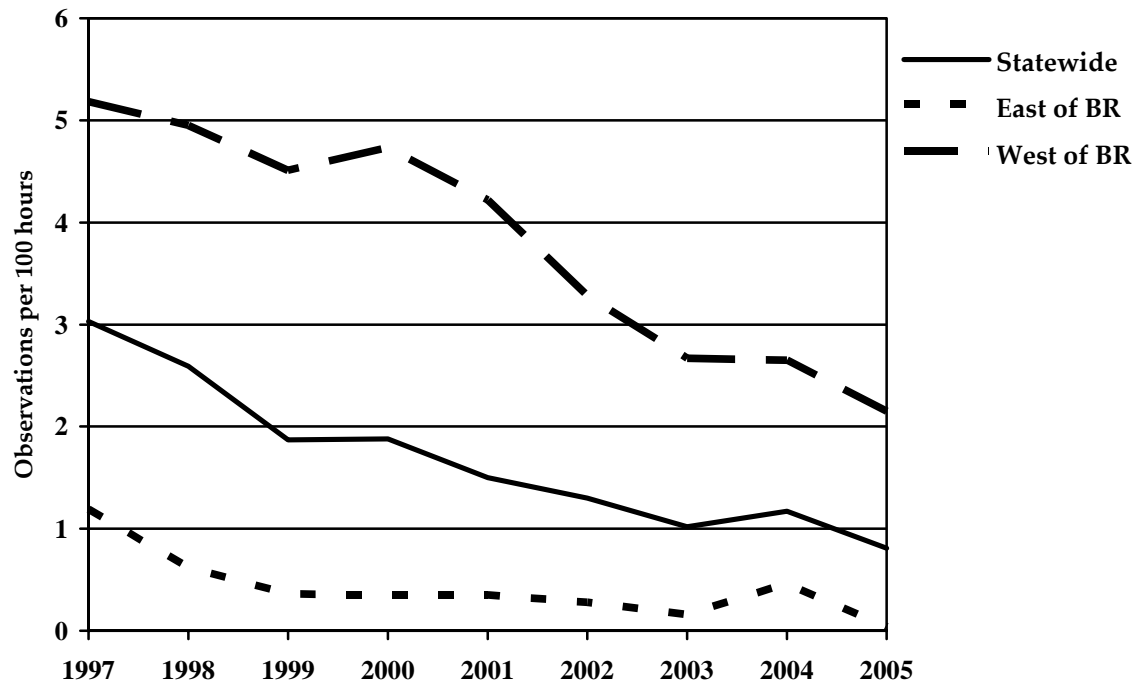


Figure 3. Ruffed grouse observed (per 100 hours of hunting) by cooperating early archery hunters from 1997–05 east and west of the Blue Ridge Mountains and statewide in Virginia.

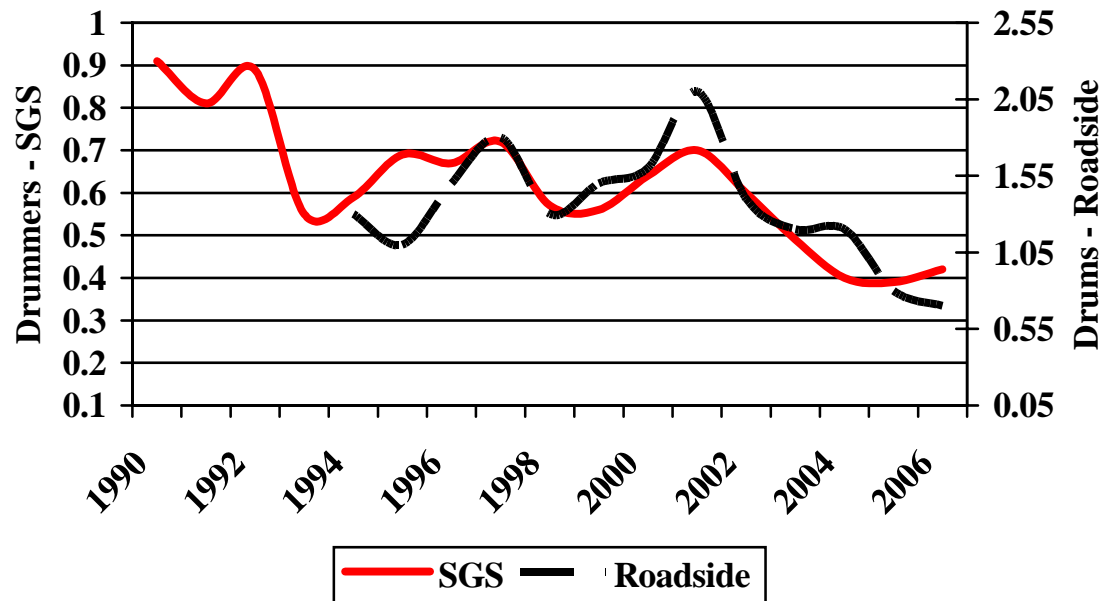


Figure 4. Trends in breeding population indices from spring gobbler hunter surveys and roadside drumming surveys in Virginia.

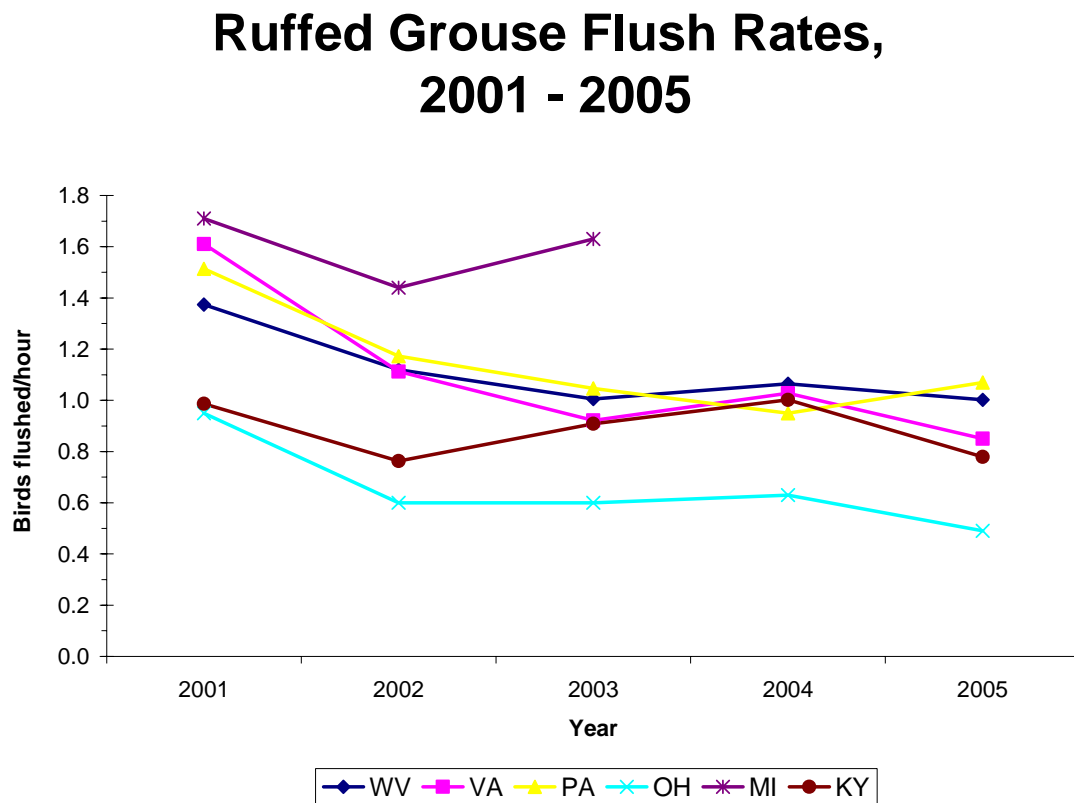
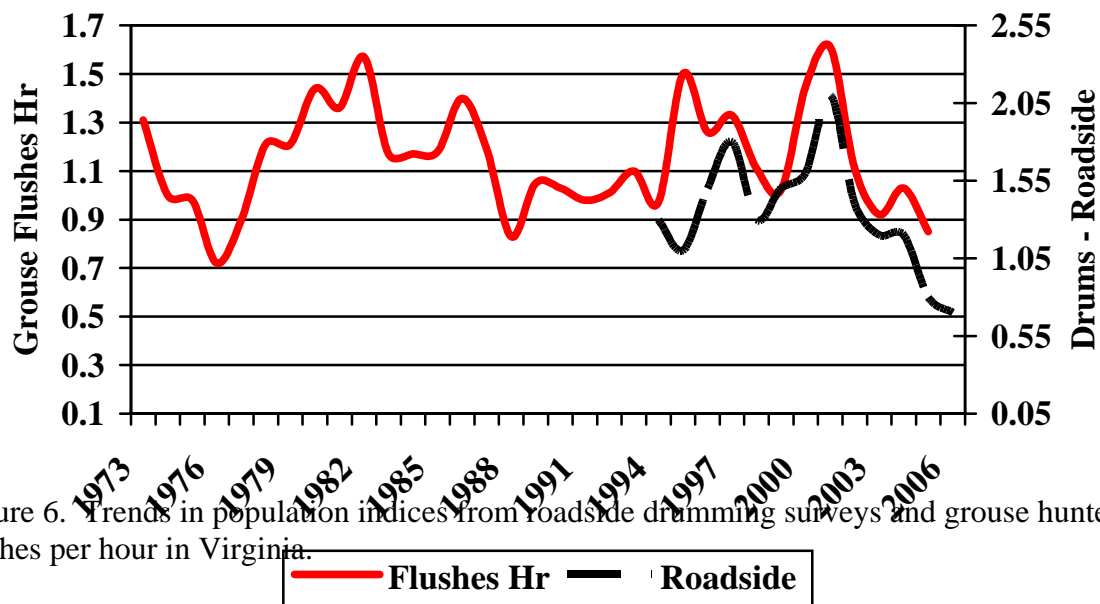


Figure 5. Regional ruffed grouse flushing rates.



RUFFED GROUSE SURVEY

NAME: _____
ADDRESS: _____

For further information contact Gary Norman at Virginia Department of
Game and Inland Fisheries, P.O. Box 996, Verona, VA 24482 or call
540-248-9389.

INSTRUCTIONS:
Only one hunter per party needs to complete this
form. Count every flush even if you believe it is the
same bird. Count flushes whether you see the bird
or not. All information regarding hunters and county
information will be kept in confidence. Mail survey
and feather samples as soon as possible after the
season closes.

MONTH - DAY - YEAR	COUNTY	LAND TYPE	HUNTERS IN PARTY	HOURS HUNTED	GROUSE FLUSHED	GROUSE KILLED	HUNT WITH DOGS (CHECK)	RATE QUALITY OF THIS HUNT (CHECK)	COMMENTS
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
-							YES NO <input type="checkbox"/> <input type="checkbox"/>	POOR ADEQUATE EXCELLENT <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </	

Appendix B.

RUFFED GROUSE AND WILD TURKEY SURVEY Virginia Department of Game and Inland Fisheries										ROUTE NUMBER	
OBSERVER'S NAME: (F. INITIAL, M. INITIAL, LAST) <div style="border: 1px solid black; width: 100px; height: 1.2em; margin-bottom: 5px;"></div> MAILING _____ ADDRESS _____ ZIP CODE _____ PHONE (____) _____										COUNTY	
										DATE OF SURVEY	
										YEAR MONTH DAY	
THIS IS THE <input type="checkbox"/> 1ST <input type="checkbox"/> 2ND RUN OF THIS ROUTE THIS YEAR WAS THIS ROUTE RUN BY YOU LAST YEAR? <input type="checkbox"/> YES <input type="checkbox"/> NO											
OFFICIAL SUNRISE			SKY CONDITION			TEMPERATURE		WIND (See Back)		PRECIPITATION	
: AM			<input type="checkbox"/> CLEAR <input type="checkbox"/> 1/4 OVERCAST <input type="checkbox"/> 1/2 OVERCAST <input type="checkbox"/> 3/4 OVERCAST <input type="checkbox"/> > 3/4 OVERCAST			°F °C 35-39 <input type="checkbox"/> 2-4 40-49 <input type="checkbox"/> 5-9 50-59 <input type="checkbox"/> 10-15 60+ <input type="checkbox"/> 16+		<input type="checkbox"/> CALM <input type="checkbox"/> GENTLE (1-3 mph) <input type="checkbox"/> LIGHT (4-7 mph) <input type="checkbox"/> MODERATE (8-12 mph) <input type="checkbox"/> STRONG (> 12 mph)		<input type="checkbox"/> NONE <input type="checkbox"/> MIST <input type="checkbox"/> SNOW, HEAVY RAIN <input type="checkbox"/> FOG <input type="checkbox"/> LIGHT RAIN	
ROUTE START TIME			: AM								
STOP NUMBER	ODOMETER READING	TIME	TOTAL DRUMS IN 4 MINUTES	NO. INDIVIDUAL TURKEYS GOBBLING	DISTURBANCE (See Back)				REMARKS		
					NO	LOW	MOD	HI			
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
TOTAL											
TOTAL STOPS		ACCEPTABLE STOPS		TOTAL DRUMS ON ACC. STOPS		NO. INDIVIDUAL TURKEYS GOBBLING		ROUTE STATUS			
DO NOT WRITE IN SHADED AREAS											
PLEASE READ INSTRUCTIONS ON REVERSE SIDE CAREFULLY AND COMPLETELY											
Main points to consider are listed below:											
(1) Conduct survey within dates specified.											
(2) Begin route 30 minutes BEFORE sunrise. Sunrise times are listed on route map.											
(3) Stops should be at 1 mile intervals. Listen for exactly 4 minutes at each stop.											
(4) Do not conduct survey if temperature is below 40° F (5° C), in moderate wind (≥ 8 mph), or if persisting rain develops.											
(5) Fill out ALL SECTIONS of this form and mail form.											

Appendix B.

SURVEY INSTRUCTIONS

OBSERVER	It is preferable that the same observer run the same route each year. When this is not possible, it is desirable for both observers (old and new) to run the survey together once, so that there is a smooth transition with the new observer becoming thoroughly familiar with survey procedures and local route conditions. Both observers should record their results independently.
DATES	For 2001, the first run should be during the week of April 9-13; second run during April 16-20
TIME	Begin 30 minutes before sunrise. Sunrise times for April 11, 13, 15, and 17 are listed on each route map. Interpolate sunrise time for dates not listed on the map.
PROCEDURE	At stop No. 1 shut off your vehicle's engine, step several feet away and record the time you begin listening. Listen for 4 minutes and count total drums heard. Also determine the number of wild turkeys gobbling and record data. Then proceed rapidly 1 mile to the next stop and repeat the procedure. Continue to do so until all 10 stops have been covered. If a bad traffic hazard prevents stopping within 100 ft. of the 1 mile odometer reading, proceed to the next stop and note "no stop-hazardous" in the space for the stop omitted.
THINGS TO AVOID	Do not run routes when the temperature is below 40° F, in heavy precipitation or moderate wind (≥ 8 mph).
REPORTING	Immediately after running your route for the second time, mail the forms in the envelopes provided.

ESTIMATING WIND VELOCITY	Velocity (mph)	Suggestions for Estimating Wind Velocity
	Less than 1	Smoke rises vertically
	1 to 3	Direction of wind shown by smoke drift, but not by wind vanes.
	4 to 7	Wind felt on face, leaves rustle, ordinary wind vane moves.
	8 to 12	Leaves and small twigs in constant motion; wind extends light flag.
	13 to 18	Raises dust and loose paper; small branches are moved.

DISTURBANCE	<u>Disturbance</u>	<u>Description</u>	<u>Example</u>
	NO	No appreciable effect on count.	Occasional crow calling.
	LO	Slightly affecting count.	Distant tractor noise.
	MOD	Moderately affecting count.	Intermittent traffic.
	HI	Seriously affecting count.	Heavy-continuous traffic

g:\wildlife\oorman\grouse\survey instructions